

The Hemiphlebia damselfly *Hemiphlebia mirabilis* Sélys (Odonata, Zygoptera) as a flagship species for aquatic insect conservation in south-eastern Australia

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Abstract

The endemic damselfly *Hemiphlebia mirabilis* Sélys has been a focus of conservation attention since its rediscovery in Victoria was publicised in the mid 1980s. It was listed under the state's Flora and Fauna Guarantee Act (FFG) in 1991. Discovery of additional colonies has indicated that *Hemiphlebia* is far more widespread than earlier supposed, and continued study indicates that it is variously secure or vulnerable in different places – rather than 'endangered', as previously thought. The history of study of the species is summarised briefly, and its values in promoting awareness of insect conservation as a 'flagship species' in southern Australia are discussed. (*The Victorian Naturalist* 124 (4) 2007, 269-272)

Introduction

The Hemiphlebia damselfly *Hemiphlebia mirabilis* (Fig. 1) is now also known as the 'Ancient Greenling' (Theischinger and Hawking 2006). It is well known as one of Australia's most unusual endemic damselflies. It is commonly referred to as a 'living fossil', and is treated conventionally as the only extant member of the superfamily Hemiphlebioidea, implying that it is taxonomically isolated within the order Odonata. Indeed, Trueman (1996) believed that it

was the sister-group to all other Odonata. This isolated position, rendering it a distinct 'oddy' within the order, is implied by unusual wing venation and the form of the larval labium. Trueman (1999) reappraised both characters and suggested that they may in fact be derived, rather than primitive as commonly presumed. *Hemiphlebia mirabilis* is also of interest for its elaborate display behaviour, and is one of the smallest Odonata.



Fig. 1. Male *Hemiphlebia mirabilis*, Wilsons Promontory, Victoria.

Much of its conservation interest arises from its putative isolated phylogenetic position, coupled with the belief that it might have become extinct in the mid 1970s, due to habitat loss through agricultural intensification in the Yarra and Goulburn valleys, Victoria. Over that period, a number of searches failed to yield the insect, which appears always to have been highly localised and known from few places. Thus, Wells *et al.* (1983) categorised it as 'endangered', at a time when it was believed to be extinct, and Moore (1982) placed it as the highest global priority for conservation of the then newly formed Odonata Specialist Group of the World Conservation Union's Species Survival Commission. *Hemiphlebia* was thus something of a 'holy grail' for Australian dragonfly enthusiasts, but it was not until Davies (1985) publicised a record by Garrison from Wilsons Promontory and established its presence there for himself, that its continued existence was confirmed, and the conservation status and biology of *Hemiphlebia* could be appraised in more detail. In this note, I recapitulate briefly the sequence and extent of data accumulation on *Hemiphlebia*, and indicate how this has led to more realistic appraisal of its conservation needs, and also explore the wider context of *Hemiphlebia*'s importance in developing insect conservation awareness in Australia. The species is amongst the few invertebrates already the focus of conservation interest at the time FFG came into force, and has remained so ever since.

Biology and Conservation

Although *H. mirabilis* was stated to have been described from Port Denison, Queensland, this locality citation is now accepted generally as erroneous for Lake Denison, Victoria, which has long been drained but is in the same general area as all other mainland distribution records. Davies (1985) documented a strong colony in Wilsons Promontory National Park, which was explored further in 1987-1988 (Sant and New 1988), to clarify its life history further, to characterise its habitat as far as possible, and to explore its distribution on the northern part of the park. Wilsons Promontory was then the only place known to support *Hemiphlebia*, but

subsequent searches showed it to occur in the Goulburn Valley as well, both at Yea and near the billabong at Alexandra, from where Tillyard described the larva and found the damselfly over a long period (1906-1931: ANIC records, see Watson 1995) (Trueman *et al.* 1992). *Hemiphlebia* was also found to be quite abundant at localities in north-east Tasmania and on Flinders Island (Endersby 1993; Trueman *et al.* 1992), with the implication that it formerly may have occurred more extensively across the eastern land bridge that linked Tasmania with south-eastern Victoria.

Hemiphlebia is univoltine, with adults present from late November to late February. Adults are very cryptic, and are inconspicuous when they rest on dense vegetation. The usual habitat is densely vegetated seasonal swamps/ billabongs/ lagoons, with shallow (often 20-60 cm deep) water and with the margins seasonally dry. Many formerly suitable habitats, particularly in the Goulburn and Yarra valleys, have been destroyed or degraded severely by drainage and cattle trampling. Fringing areas with dense reeds or other emergent vegetation appear to be critical habitat components, with seasonal desiccation suggesting strongly that *Hemiphlebia* has a well-developed mechanism for overcoming periods of drought, possibly as the egg stage. Larvae are small in early spring, and their main growth phase is from August to November: there appear to be 9 or 10 instars.

Hemiphlebia was a natural candidate for early nomination for protection under FFG, as a formal prelude to preparing an Action Statement on its conservation status and needs. Grounds included in the nomination (April 1990) were that (1) it had disappeared from localities in the state where it previously occurred; (2) is primarily threatened by habitat degradation, particularly involving drainage, damage by cattle, and river regulation; (3) that the Wilsons Promontory population was threatened by park management practices; and (4) that the species is rare in terms of abundance and distribution. Together with uncertainties over the recovery from a major burn of the largest known colony on

Wilson's Promontory (1987), *Hemiphlebia* was a strong candidate for listing, and it was formally listed in May 1991 as one of the first batch of non-marine invertebrates to be so designated.

Progressive accumulation of information on *Hemiphlebia* has led to informal downgrading of conservation status, with various sites now regarded as secure or vulnerable, notwithstanding Watson's (1995) comment that 'its future can be regarded as secure'.

The major concern for its welfare in the late 1980s centred on the outcomes of a fire at Wilson's Promontory. The main habitat of *Hemiphlebia*, on Five Mile Road, abutted a fire break mown along a road, and a control burn (part of the management strategy to regenerate heathland along the northern part of the National Park, to reduce ground fuel loads, and to provide a barrier to passage of more severe uncontrolled blazes) got 'out of control' and swept through the swamp, with potentially severe consequences; it was feared that the damselfly might have been extirpated.

In fact, the mown area, across about half the swamp area, remained green. However, the very dry summer and autumn also led to concentration of cattle seeking water – at this time, the region was part of a long-term grazing lease, phased out in 1992 – which led to considerable trampling of the swamp. Factors causing concern for the colony were (1) loss of emergent vegetation, increasing exposure of the water; (2) deposition of ash on the water; and (3) increased cattle access, trampling and dung deposition. Subsequently the area was fenced by the parks staff to exclude cattle. The fence was left in place for some seven years, whilst the area had a chance to recover. Subsequent monitoring (New 1993) showed gradual recovery of *Hemiphlebia*, apparently reflecting that the mown part of the habitat constituted a refuge for part of the population, and numbers of adults gradually increased in the entirely burned area. Recovery from severe habitat disturbance is clearly possible, and it is likely that *Hemiphlebia* may have experienced numerous similar catastrophes during its long history.

Indeed, if we categorise the major threats to native invertebrates in Australia, the top concerns would be habitat change through vegetation clearing, impacts of exotic (often, invasive) organisms, and agricultural practices. All are relevant to *Hemiphlebia*, with the last-named the most significant impetus for habitat degradation. Nevertheless, and despite evidence of its widespread survival, *Hemiphlebia* does appear to have been lost from some former inhabited sites, with agriculture and cattle clearly implicated in this decline. The small number and dispersion of colonies currently known merits its retention as a species of conservation significance. Some colonies in both range-states are in National Parks, so that opportunity for practical management is present, and methods of habitat maintenance are reasonably clear – with ambiguities over the extent of disturbance that may be tolerated. It is likely that *Hemiphlebia* will be more widespread than the few current disjunct records imply, although searches have so far failed to confirm this and more detailed surveys, particularly through the Goulburn Valley, are warranted.

Discussion

As well as being a species of significant conservation interest as a 'target', *Hemiphlebia* also has become a notable flagship species, as a wider conservation 'tool'. As a member of a small portfolio of ecologically disparate invertebrates targeted for conservation in Victoria, all of which were promoted under FFG in its early years, it has helped to make many people aware of the ecological variety of invertebrates and their conservation needs.

Flagship species are 'ambassadors', helping to communicate importance and conservation lessons to a wider audience and to increase appreciation of the 'place' of invertebrates in natural systems. Because of its presence in National Parks, *Hemiphlebia* has had a special role in helping to get invertebrates included in park conservation agendas. Particularly at Wilson's Promontory it has been accepted by staff as one of 'their' special species, with staff being aware of where it occurs and its significant interest. This increased awareness has had a wider impact. In

Australia we have no coordinated inventory program to document invertebrates in high quality reserves, and most records are simply scendipitous. Odonata, thanks to recent handbooks (Watson *et al.* 1991; Theischinger and Hawking 2006) are largely identifiable to species level as adults and larvae, and an increasing number of park surveys is being instigated as a basis for evaluating species' representation on reserves, to provide a sound template for future complementarity of protected areas.

The cryptic nature of *Hemiphlebia* means that, unlike more conspicuous insects such as butterflies, most people who support its conservation strongly have never seen it alive, but nevertheless accept it as important.

Whereas *Hemiphlebia* is now known from two states, with the strong implication that it has been distributed more widely in the past (so that present colonies are remnant populations), it is still known from relatively few localities and has not been found west of Melbourne, on King Island or north-western Tasmania, so that it may never have occurred on the western land bridge region. It may well occur elsewhere, but is elusive, and has successfully evaded detection during numerous comprehensive surveys of aquatic invertebrates throughout the state undertaken through Museum Victoria. It is clearly resilient to disturbance, but not to loss of habitat, and appears to fly weakly and thus to be a feeble disperser. Individual site/colony management is thus the key to practical conservation but, as for many other invertebrates, 'management' may mean prevention of major change or intrusion, and – in some cases – possibly changing land tenure to help meet this basic need. Its conservation needs thereby reflect it satisfying both the 'small population' (thereby being susceptible to stochastic effects in small areas) and the 'declining population' (implied, without solid population data, and reflected in overall decline in range) of Caughley (1994).

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